F A C T S H E E T

Monticello Mill Tailings Site—Operable Unit III Alternatives Analysis of Soil and Sediment

United States Department of Energy
Grand Junction Office

March 1998

This fact sheet summarizes the Alternatives Analysis Report which identifies and evaluates cleanup alternatives for soil and sediment adjacent to Montezuma Creek, which is part of Operable Unit (OU) III of the Monticello Mill Tailings Site. The OU III soil and sediment area has been divided into three segments: Upper, Middle, and Lower Montezuma Creek. Alternatives and recommended removal actions were developed separately for each segment.

Site Background

OU III of the Monticello Mill Tailings Site is located in southeastern Utah, in and near the city of Monticello. The Monticello Mill Tailings Site is the location of a former vanadium and uranium mill which operated between 1942 and 1960. In 1989, it was placed on the National Priorities List. The U.S. Department of Energy (DOE) is the Federal lead agency over cleanup activities. The U.S. Environmental Protection Agency (EPA) and the State of Utah share the responsibility for oversight. The OU III project involves investigating and, if necessary, cleaning up contaminated surface water and groundwater at and downstream of the millsite. It also involves investigating and possibly cleaning up soils and sediments deposited downstream of the millsite adjacent to Montezuma Creek. The soil and sediment area of OU III (Figure 1) includes the segment of the Montezuma Creek floodplain extending from approximately 0.5 mile east of the eastern boundary of the millsite to approximately 3,000 feet (ft) below the confluence of Montezuma Creek with Vega Creek. This fact sheet summarizes the alternatives for the soil and sediment portions of OU III.

Nature and Extent of Contamination

Contamination in the OU III soil and sediment area was transported by Montezuma Creek from the millsite to downstream locations. Radium-226 (Ra-226) was used as an indicator to define the extent of contamination. Other contaminants detected include arsenic, copper, lead-210, thorium, uranium, vanadium, and gamma radiation. These contaminants have a distribution similar to that of Ra-226.

The Ra-226 contamination occurs in a narrow band following the path of Montezuma Creek and is generally less than 24 inches in depth. The downstream boundary of the OU III soil and sediment area represents the downgradient extent of significant Ra-226 contamination.

Ra-226 contamination was defined as levels that exceed 5 picocuries per gram (pCi/g) above background, based on the 5/15 pCi/g Ra-226 cleanup standard (5 pCi/g Ra-226 above background in the top 6 inches of soil and 15 pCi/g at depths greater than 6 inches) used on many properties in the Monticello area. Background levels of Ra-226 in the Monticello area

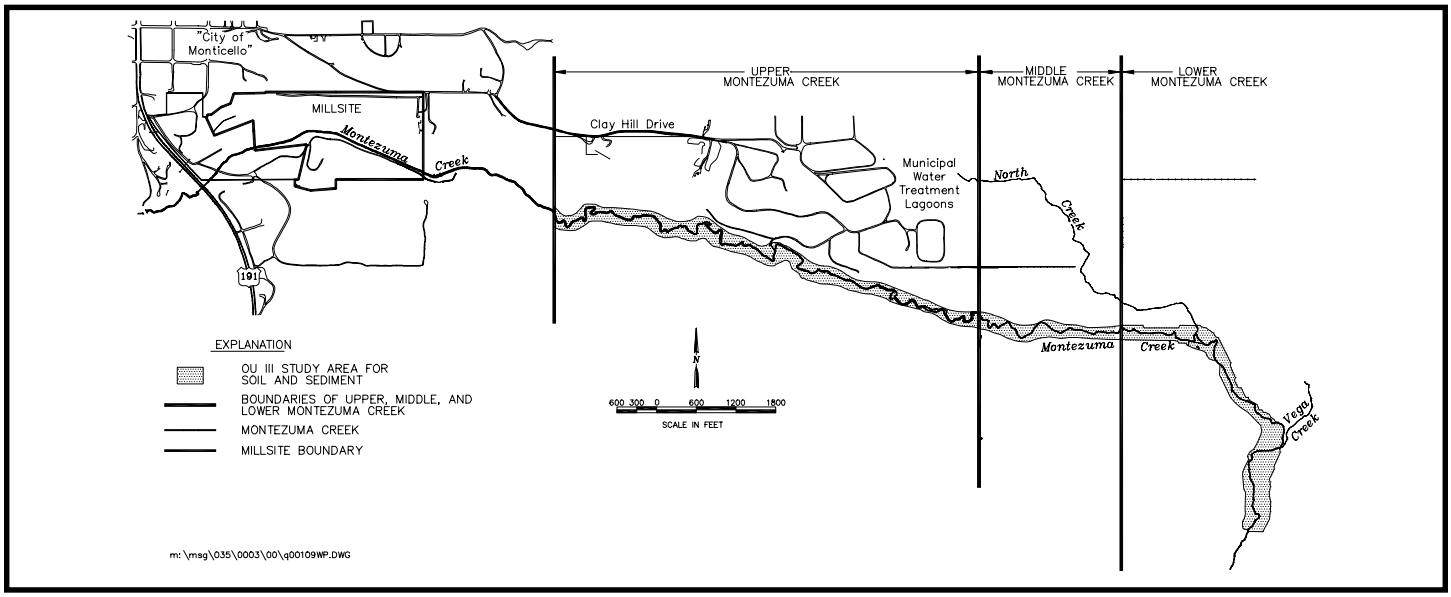

Figure 2. Operable Unit III Soil and Sediment Area

average 1 to 2 pCi/g, tailings on the millsite average 500 to 800 pCi/g, and contamination around Montezuma Creek is generally less than 100 pCi/g with a few isolated hot spots that exceed 100 pCi/g.

Human Health Risk Assessment

A baseline human-health risk assessment was prepared for OU III that evaluated risks to human health from all sources. The primary populations potentially exposed to contaminated soil and sediment are nearby residents who own or use the land adjacent to Montezuma Creek. Risks were estimated for carcinogenic (cancer causing) and noncarcinogenic substances using two exposure scenarios. One scenario is based on very conservative assumptions (reasonable maximum exposure [RME]) and the other on more typical or likely assumptions (central tendency [CT]). For carcinogenic substances, risks are expressed as a probability of added cancer risk. For noncarcinogens, risks from individual substances are summed into a hazard index. Also, a radiological dose was calculated that estimated the exposure to external radiation plus inhalation and ingestion of radioactive substances.

The human health risk assessment found that the adverse health effects from nonradioactive substances and noncarcinogens were not significant as measured by the hazard index. Also, the radiological dose from external radiation plus inhalation and ingestion of radioactive substances was acceptable. The risks from radioactive substances were within EPA's risk range of 1×10^{-4} to 1×10^{-6} added cancer risk. An individual cancer risk of 1×10^{-6} is an added chance of cancer incidence (or mortality for radionuclides) of 1 in 1,000,000 people (1×10^{-4} corresponds to 1 in 10,000 people) attributable to exposure to site-related contamination. Within the EPA risk range, the risk managers usually determine the extent of cleanup.

Ecological Risk Assessment

An assessment was completed to evaluate the potential risks to plants and animals associated with exposure to contaminants currently present within OU III. All receptors assessed appear to be at no significant risk from exposure to the soil and sediment contamination. Because sensitive receptors were chosen for the evaluation, it is presumed that other wildlife (including livestock) are not at risk.

Remediation Alternatives

Alternatives considered for the cleanup of Upper, Middle, and Lower Montezuma Creek are listed in Table 1. The table includes the cleanup level for alternatives that involve excavation or the activity, such as no action or institutional controls, for alternatives that do not involve excavation.

The alternatives for each segment of Montezuma Creek were evaluated against the seven criteria listed below.

Threshold Criteria: 1) Protection of human health and the environment, and 2) Compliance with applicable or relevant and appropriate (ARARs) regulations

Balancing Criteria: 1) Long-term effectiveness, 2) Reduction in toxicity, mobility, or volume, 3) Short-term effectiveness, 4) Implementability, and 5) Cost

To be selected, an alternative must meet the two threshold criteria. The risk assessment is the primary tool used to evaluate protection of human health and the environment. All the alternatives are within the EPA acceptable risk management range for human health. The main regulations that apply to the alternatives are 40 Code of Federal Regulations (CFR) 192, dredge or fill requirements (Section 404 of the Clean Water Act), and floodplain/wetlands requirements. Other than the No Action alternatives, all of the alternatives presented below, if properly implemented, meet the threshold criteria.

The balancing criteria evaluate the performance of the alternatives and are used to weigh the relative performance of one alternative against another. The alternatives will be evaluated against two additional criteria (modifying criteria) after the public comment period: State Acceptance and Community Acceptance. The modifying criteria can be used to change or "modify" the proposed alternative.

Upper Montezuma Creek

Alternative 1, No Action, does not include excavation of contaminated soil and sediment and does not include measures to mitigate risk or reduce human exposure, such as institutional controls. This alternative may require 5-year reviews, which is reflected in the net present cost presented in Table 1.

Alternative 2, Institutional Controls, consists of applying an institutional control to ensure that future land use remains protective of human health. The institutional control could be a range of actions such as restrictive zoning, deed annotation, restrictive easements (i.e., DOE purchasing an interest in the property), or DOE purchasing the entire property. Alternative 2 applies supplemental standards to be in compliance with 40 CFR 192. The cost of this alternative presented in Table 1 involves a range of costs. The low figure includes only the cost of long-term surveillance and maintenance with 5-year reviews. The high figure includes the cost of long-term surveillance and maintenance, 5-year reviews, and the initial purchase of 285 acres.

Alternative 3, Remediation to an Alternate Cleanup Level, involves excavation of contaminated soil and sediment with radiation levels greater than 35 µR/h (approximately 18 pCi/g Ra-226). The

Table 1. Montezuma Creek Alternatives

Alternative	Cleanup Level or Activity	Residual Health Risk-RME/CT[1]	Excavation Area/Volume	Net Present Cost[2]
Upper Montezuma Creek				
Alternative 1	No Action	$6.8 \times 10^{-5}/6.9 \times 10^{-6}$	0 acres/0 yd^3	$153,000
Alternative 2	Institutional Controls	$6.8 \times 10^{-5}/6.9 \times 10^{-6}$	0 acres/0 yd^3	$153,000–$399,000
Alternative 3	35 μR/h gamma (18 pCi/g Ra-226)	$3.9 \times 10^{-5}/4.0 \times 10^{-6}$	4.9 acres/14,300 yd^3	$1,250,000
Alternative 4, Option A	5/15 pCi/g Ra-226	$6.2 \times 10^{-5}/6.3 \times 10^{-5}$	4.6 acres/8,300 yd^3	$1,131,000
Alternative 4, Option B	5/15 pCi/g Ra-226	$3.3 \times 10^{-5}/3.3 \times 10^{-6}$	16.2 acres/34,700 yd^3	$2,541,000
Alternative 5	5/15 pCi/g Ra-226	$3.1 \times 10^{-5}/3.1 \times 10^{-6}$	20.1 acres/41,900 yd^3	$2,772,000
Middle Montezuma Creek				
Alternative 1	No Action	$4.7 \times 10^{-6}/4.7 \times 10^{-7}$	0 acres/0 yd^3	$153,000
Alternative 2	Institutional Controls	$4.7 \times 10^{-6}/4.7 \times 10^{-7}$	0 acres/0 yd^3	$153,000–$240,000
Alternative 3	35 μR/h gamma (18 pCi/g Ra-226)	$3.1 \times 10^{-6}/3.1 \times 10^{-7}$	0.5 acre/1,400 yd^3	$641,000
Alternative 4	5/15 pCi/g Ra-226	$2.5 \times 10^{-6}/2.5 \times 10^{-7}$	2.5 acres/4,900 yd^3	$668,000
Lower Montezuma Creek				
Alternative 1	No Action	$9.2 \times 10^{-6}/6.0 \times 10^{-7}$	0 acres/0 yd^3	$153,000
Alternative 2	Institutional Controls	$9.2 \times 10^{-6}/6.0 \times 10^{-7}$	0 acres/0 yd^3	$153,000–$911,000
Alternative 3, Option A	35 μR/h gamma (18 pCi/g Ra-226)	$5.7 \times 10^{-6}/3.7 \times 10^{-7}$	1.5 acres/4,600 yd^3	$739,000
Alternative 3, Option B	80 μR/h gamma (57 pCi/g Ra-226)	$8.6 \times 10^{-6}/5.6 \times 10^{-7}$	0.1 acre/500 yd^3	$233,000
Alternative 4	5/15 pCi/g Ra-226	$5.0 \times 10^{-6}/3.2 \times 10^{-7}$	5.0 acres/12,800 yd^3	$1,114,000

[1]Residual Health Risk listed in terms of added cancer risk.

[2]The net present cost is calculated according to EPA guidance. It incorporates costs that occur in different years into a single figure. Net present costs are relative and should only be used for comparison to other alternatives.

Key: CT=central tendency; pCi/g=picocuries per gram; Ra-226=radium-226; RME=reasonable maximum exposure; μR/h=microroentgen per hour; yd^3=cubic yards.

excavation area extends from the upper end of Upper Montezuma Creek downstream 7,250 feet (measured along Montezuma Creek). Excavation depth would be based on a Ra-226 level of 15 pCi/g above background. Alternative 3 applies supplemental standards to be in compliance with the criteria in 40 CFR 192. 40 CFR 192 allows cleanup levels other than those specified in the regulation, called supplemental standards, to be used under certain conditions. One of the conditions is that if cleanup to the 5/15 pCi/g standard would cause excessive environmental harm. To reduce adverse environmental effects, remediation would be limited in the beaver-pond reach of Upper Montezuma Creek.

Alternative 4, Remediation to 5/15 pCi/g for Ra-226 over Portions of Upper Montezuma Creek, includes two options. Option A involves the remediation of the uppermost 2,700 feet of Upper Montezuma Creek to 5/15 pCi/g Ra-226 and provides no action in the rest of Upper Montezuma Creek. Option B involves remediation of 7,250 feet of Upper Montezuma Creek to 5/15 pCi/g Ra-226 and no action in the lower portion. All excavated material would be transported to the repository. Both options would apply supplemental standards to be in compliance with the criteria in 40 CFR 192.

Alternative 5, Remediation to 5/15 pCi/g Ra-226, involves excavation of all areas of Upper Montezuma Creek with contaminated soil and sediment exceeding the 5/15 pCi/g Ra-226 cleanup level. All excavated soil and sediment would be transported to the repository.

Recommended Removal Action

The recommended removal action for Upper Montezuma Creek is a combination of Alternative 2 and Alternative 3. The recommended action would remove contaminated soil and sediment with radiation levels that exceed 35 µR/h (approximately 18 pCi/g Ra-226) and apply institutional controls in the form of a restrictive easement, affecting 31 acres. The recommended action would comply with all ARARs; compliance with 40 CFR 192 would be achieved with supplemental standards. The residual risks of the recommended action are those of Alternative 3, as shown in Table 1. The proposed action makes use of as low as reasonably achievable (ALARA) guidance while minimizing environment degradation and meeting the two threshold criteria.

Middle Montezuma Creek

Alternative 1, No Action. See discussion for Upper Montezuma Creek.

Alternative 2, Institutional Controls. This alternative is similar to Upper Montezuma Creek Alternative 2 except 86 acres would be affected if the land were purchased.

Alternative 3, Remediation to an Alternate Cleanup Level, involves excavation of contaminated soil and sediment with radiation levels greater than 35 µR/h (approximately 18 pCi/g Ra-226). Excavation depth would be based on a Ra-226 level of 15 pCi/g above background. Alternative 3 would apply supplemental standards to be in compliance with 40 CFR 192.

Excavated soil and sediment would be placed in the repository.

Alternative 4, Remediation to 5/15 pCi/g Ra-226, involves excavation of all areas of Middle Montezuma Creek with contaminated soil and sediment that exceeds the 5/15 pCi/g Ra-226 cleanup level. All excavated soil and sediment would be transported to the repository.

Recommended Removal Action

The recommended action for Middle Montezuma Creek is Alternative 2. The institutional control will be in the form of a restrictive easement, affecting 7 acres. The recommended action will comply with all ARARs; compliance with 40 CFR 192 would be achieved with supplemental standards. The residual risk of the recommended action are those of Alternative 2, as shown in Table 1.

Lower Montezuma Creek

Alternative 1, No Action. See discussion for Upper Montezuma Creek.

Alternative 2, Institutional Controls. This alternative is similar to Upper Montezuma Creek Alternative 2 except 554 acres would be affected if the land were purchased.

Alternative 3, Remediation to an Alternate Cleanup Level, includes two options. Option A involves excavation of contaminated soil and sediment with radiation levels greater than 35 µR/h (18 pCi/g Ra-226). Option B involves excavation of soil and sediment with radiation levels greater than 80 µR/h (57 pCi/g Ra-226). The depth of excavation for both options is based on 15 pCi/g Ra-226 above background. Alternative 3 applies supplemental standards to be in compliance with 40 CFR 192. Excavated soil and sediment would be placed in the repository.

Alternative 4, Remediation to 5/15 pCi/g Ra-226, involves excavation of all areas of Lower Montezuma Creek with contaminated soil and sediment that exceed the 5/15 pCi/g Ra-226 cleanup level. Excavated soil and sediment would be transported to the repository for placement.

Recommended Removal Action

The recommended action for Lower Montezuma Creek is a combination of Alternative 2 and a modification of Alternative 3, Option B. The proposed action would remove contaminated soil and sediment with radiation levels that exceed 80 µR/h (approximately 57 pCi/g Ra-226) from four areas in the upper end of Lower Montezuma Creek and apply institutional controls in the form of a restrictive easement, affecting 17 acres. Excavation within the four areas identified for remediation will continue until the Ra-226 activity is less than 15 pCi/g above background or groundwater is encountered. The action would comply with all ARARs; compliance with 40 CFR 192 would be achieved with supplemental standards. The proposed removal action differs from Alternative 3, Option B, in that only the most significant areas identified with radiation activity greater than 80 µR/h would be remediated and excavation would not go below groundwater to remove soil and sediment with Ra-226 activities greater than 15 pCi/g above background. The residual risks of the recommended action are those of Alternative 3, Option B, as shown in Table 1.

Next Steps

There will be a 30-day public comment period on DOE's recommended removal actions beginning on March 27, 1998, and ending on April 27, 1998. The Administrative Record for the Monticello Mill Tailings Site contains the documents that were prepared to assist in making decisions on site cleanup. They can be reviewed at the Monticello City Offices, 17 North 1st Street East, Monticello, Utah, from 8:00 a.m. to 4:30 p.m. Monday through Friday. DOE will hold a public meeting on April 7, 1998, in the Monticello High School Auditorium from 7:00 to 9:00 p.m. DOE will be working toward finalization of the design for excavation activities and seeking approval from the landowners during this time and concurrence of EPA and the State of Utah.

Selection of the excavation contractor is scheduled to occur no later than May 11, 1998, and the selected removal action is proposed to begin on or about June 5, 1998.